University of Connecticut
Office of the Provost

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Testimony

By

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Provost

Legislative Program Review and Investigations Committee Public Hearing

March 1, 2010

Co-Chairs and Members of the Committee, thank you for providing me with an opportunity to submit written testimony on three bills currently under consideration by the Committee.

Before commenting specifically on the bills, I would like to stress that the University shares the Committee's goal of aligning our academic programs with the state's workforce and economic development needs. As our October testimony to the Committee indicated, we are continuously reviewing our academic programs to ensure alignment, and it is a core tenet of our recently approved Academic Plan. In response to workforce and industry needs, UConn has increased enrollment in key areas like engineering, and the life and physical sciences. We have also developed new or expanded programs in nanotechnology, finance, environmental science and entrepreneurship. We contribute significantly to Connecticut's talented workforce; graduating doctors, dentists, nurses, engineers, teachers, lawyers, pharmacists, business and financial analysts, communication and media specialists, and scientists. Seventy percent of our student stay in Connecticut after graduation and contribute daily to our economy.

Since we are the state's only public research university, we take our unique role in promoting the commercialization and technology transfer very seriously. In the past decade alone, our faculty have generated 184 patents, and we have begun to incubate new businesses from University research. Our expanded research and technology transfer activities provide our students at the undergraduate, graduate and doctoral levels with skills that will make them invaluable to Connecticut industry.

The University commends the Committee for focusing on this important area and hopes that the following information is helpful as the legislative process continues.

House Bill 5164, An Act Implementing the Recommendation of the Program Review and Investigations Committee Concerning the Alignment of Postsecondary Education and Employment in the Green Industry

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The University supports this legislation which promotes education and training in environmental science, technology and the emerging green industry. We offer an array of academic, research and outreach programs in this area that are detailed in the attached document for your information.

Senate Bill 286, An Act Implementing the Recommendations for the Program Review and Investigations Committee Establishing a Pilot Program to Reward Institutions of Higher Education that are Meeting Established Goals

Senate Bill 286, *An Act Implementing the Recommendations for the Program Review and Investigations Committee Establishing a Pilot Program to Reward Institutions of Higher Education that are Meeting Established Goals,* creates a pilot program that would provide incentives to public institutions of higher education for meeting the goals and accountability measures established pursuant to 10a-6b.

While the University welcomes new funding opportunities, we ask the Committee to consider expanding an existing Department of Higher Education grant program which is currently successful at aligning academic programming with workforce and economic development needs. DHE's Education and Health Initiatives program – which provides grant funding to public universities and colleges to address education and healthcare workforce shortages—has helped the University respond to workforce needs in nursing very quickly. Through a grant from this program, the University was able to do a market analysis which became the impetus for the University to start Nursing programs at our Stamford and Waterbury campuses to address this important workforce shortage area. In fact, our School of Nursing hopes to begin offering programs at our Avery Point campus in the near future. The Connecticut State University System and the Community College System have also used this grant program to start similar programs in the teacher prep and healthcare professions.

The accountability measures established pursuant to 10a-6b address a number of access, quality and institutional objectives and are by no means limited to a public institution's responsiveness to workforce and economic development needs. Therefore, we believe that the most affective way to encourage public colleges and universities to address workforce needs is to expand the successful DHE Education and Health Initiatives program to encompass all workforce shortage areas.

House Bill 5349, An Act Implementing the Recommendation of the Program Review and Investigations Committee Concerning a Strategic Plan and Coordination for Alignment of Postsecondary Education and Employment

The University shares the goals of House Bill 5349, *An Act Implementing the Recommendation of the Program Review and Investigations Committee Concerning a Strategic Plan and Coordination for Alignment of Postsecondary Education and Employment.* However, it is important to balance the needs of industry with the broader mission of higher education institutions.

There are a variety of formal and informal ways in which the University interacts with industry and receives input from the private sector regarding academic programs. Almost every school and department at the University has an advisory committee with strong

industry representation. Additionally, industry routinely seeks the expertise of many of our faculty, Departments and Centers. These interactions take a variety of forms and range from technology transfer, product development, undergraduate and graduate research projects, testing and application research, and business development activities. The business and industry community provides gifts and donations which fund endowed chairs, technology, equipment, scholarships, and numerous academic programs. Finally, the private sector also partners with the University to provide our students with numerous internship opportunities. Over 200 of our undergraduate courses alone have an internship component, giving our students hands-on industry experience. These interactions are critical to our schools and departments as they develop curricula create new academic programs and analyze existing programs.

Yet despite our close ties to business and industry, the University is careful to ensure that our academic programs are not dictated by the private sector or other entities. Academic programs are best developed at the institutional level, based on faculty expertise, student demand, private sector input and institutional resources. Our curriculae is structured to ensure that students become critical thinkers with interdisciplinary skills that will allow them to contribute to business and society in a variety of ways. While we need to be responsive to the industry, higher education institutions must continue to guard against private sector "fad" degrees that quickly become obsolete and do a disservice to students by not providing a broad-based educational foundation.

In an effort to recognize higher education's need to be responsive to Connecticut's workforceforce shortages while preserving academic quality and the other important aspects of our institutional mission, we offer the following recommendations for your consideration:

Section 3 of the bill:

We ask the Committee to consider **retaining** most of the current statutory language in Section 3 (b) while adding in the majority of the new language proposed in the bill. The University believes that the current statutory language emphasizes a number of goals like equal access for qualified applicants, flexibility to meet changing economic and student needs, and the need to apply the resources of higher education institutions to the problems of society. Please see the attached alternative language.

Section 6 and 7

The University asks the Committee to consider our proposed attached language which aims to preserve the important institutional role in developing academic programs while being responsive to employment needs.

Thank you again for allowing me to submit written testimony and for your continued support of the University. Please do not hesitate to contact me if you have any questions or need additional information.

Proposed Changes to HB 5349

Section 3 (b):

(b) Within the limits of authorized expenditures, the policies of the state system of higher education shall be consistent with the following goals: (1) To ensure that no qualified person be denied the opportunity for higher education on the basis of age, sex, ethnic background or social, physical or economic condition, (2) to protect academic freedom, (3) to provide opportunities for education and training related to the economic, cultural and educational development of the state, (4) to assure the fullest possible use of available resources in public and private institutions of higher education, (5) to maintain standards of quality ensuring a position of national leadership for state institutions of higher education, (6) to [apply the resources of higher education to the problems of society] respond to the needs and problems of society, [and] (7) to foster flexibility in the policies and institutions of higher education to enable the system to respond to changes in the economy, society, technology and student interests, (8) promote the economic development of the state in order to help business and industry sustain strong economic growth, (9) ensure affordability of higher education and efficient use of resources, and (10) join with elementary and secondary schools to improve teaching and learning at all levels. Said board shall review recent studies of the need for higher education services, with special attention to those completed pursuant to legislative action, and to meet such needs shall initiate additional programs or services through one or more of the constituent units.

Sections 6 & 7

Sec. 6. (NEW) (*Effective October 1, 2010*) The Office of Workforce Competitiveness, in consultation with the Connecticut Employment and Training Commission, the Departments of Education, Higher Education, Economic and Community Development and the Labor Department, shall biennially submit to the Board of Governors of Higher Education a report identifying [the sectors or subsectors in which career pathways should be established, the workforce skills needed in those sectors or subsectors and the types of postsecondary programs required to address the workforce needs in those sectors or subsectors] workforce shortage areas.

Sec. 7. (NEW) (*Effective October 1, 2010*) On or before January 1, 2011, and annually thereafter, the [Higher Education Coordinating Council, in consultation with and using information developed by the Office of Workforce Competitiveness, shall make recommendations to the Board of Governors of Higher Education regarding (1) any postsecondary certificate or degree programs required to address workforce shortages, and (2) whether any existing postsecondary certificate or degree programs lack the capacity to address such shortages] each constituent unit of the public system of higher education shall submit a report to the Board of Governors of Higher Education on how existing and proposed academic programs address the workforce shortages identified by the Office of Workforce Competitiveness pursuant to section 6 of this act.

University of Connecticut
Green Research, Outreach and Academic Programs

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

The College of Agriculture and Natural Resources has a significant focus on environmental sustainability, the Green Industry (usually defined as turf and landscaping, nurseries, and greenhouses) and green energy (biofuels and other alternative energy sources). Annually, the Departments of Plant Science and Landscape Architecture, Natural Resources and the Environment, and Agricultural and Resource Economics conduct research and outreach programs in these areas that directly benefit Connecticut citizens and create employment opportunities. Outreach and non-credit public education is coordinated through the Department of Extension. In 2008, the college received nearly $2 million in research awards for research and outreach directly related to sustainability, the green industry and bioenergy. A few highlighted programs are noted below.

Approximately 50 faculty members (which is more than 30% of the total faculty in the college) devote at least a portion of their time to teaching, research or outreach in areas related to environmental sustainability, the green industry or bioenergy. Over the past five years, the college produced 390 undergraduates and 68 graduate students in this broad area. Determining the proportion of these students that remains in Connecticut is challenging; we do know that job placements have been very high in some areas. For example, demand for students entering the green industry has exceeded the number of graduates annually for each of the last 4 years.

Plant Science and Landscape Architecture

- In collaboration with faculty members in the Department of Natural Resources and the Environment, faculty members have worked with the green industry to develop green roof modules that are lighter weight and more drought tolerant than those previously used.
- Invasive plant species aggressively displace native species and pose a threat to the sustainable native species. The department is using faculty expertise in plant biotechnology and plant breeding to develop new cultivars of ornamental plants that are less invasive than those currently used by the nursery industry. The department is providing regional leadership to New England on invasive plant control.
- Faculty members are participating in a project to identify potential biofuel feedstocks and genetically improving those feedstocks for use in Connecticut as part of a broader bioenergy research initiative. A new $1.5 million research award has been received for the bioenergy initiative in collaboration with the School of Engineering and College of Liberal Arts and Sciences.
- A faculty member is investigating the use of plants to clean up lead-contaminated brownfield sites. The test site is located in Sprague, CT.
- With changing legislation limiting pesticide use on school athletic fields, the turf management team is investigating best practices for organic management of athletic fields.

Natural Resources and the Environment

- A faculty member is using the Gant Building "Green Roof" demonstration as a research site to investigate benefits gained from the use of green roof technology.
- Significant research is being conducted on various aspects of water quality and availability. For example, through the College's Institute of Water Resources, a drought simulation exercise was conducted with the Pomperaug Watershed Coalition that included over 40 federal, state and local officials.
- A second statewide assessment of mercury contamination of fish was recently completed in collaboration with DEP.
- The Center for Land Use Education and Research (CLEAR) provides much of the land use mapping data utilized by state agencies and local government in Connecticut. Through the Cooperative Extension

System, CLEAR delivers more than 150 community workshops annually on land use planning and use of geospatial technology. More than 10,000 visitors visit the research or outreach websites monthly. In 2009, an updated version of Connecticut's Changing Landscape web-based database was released and most recently a new Forest Fragmentation Study was released. UConn is recognized for having one of the most extensive and comprehensive land use planning programs in the nation.

Agricultural and Resource Economics

- Faculty members are engaged in research on the environmental sustainability of CT dairy farms as well as the economics of sustainable water resource management.

Outreach and Extension

- The Green Valley Institute is a partnership between the Quinebaug-Shetucket National Heritage Corridor, UConn, UMass and the Nature Conservancy. The institute has provided workshops to more than 1500 community leaders, landowners and developers on land use and conservation planning.
- The Non-point Education for Municipal Officials (NEMO) was created to provide education and assistance to municipal land use planning boards and commissions. Workshops have been held in nearly all of Connecticut's 169 towns. This program has been emulated in 30 other states or countries.
- The Land Use Academy has reached more than 600 local commissioners on land use planning. UConn extension has been designated as the lead agency for delivering land use training in CT.
- The Home and Garden Information Center provides a wide range of information on sustainable gardening, home landscapes and other topics. They respond to more than 10,000 homeowner requests annually.
- The Forest Stewardship Program trains landowners in the development of forest management plans and forest stewardship through scheduled workshops and one-on-one training.
- The Soil Testing Laboratory provides fee-based soil testing for homeowners and commercial operations. More than 15,000 soil samples are processed annually.

University of Connecticut

College of Agriculture and Natural Resources

Programs with Environmental Focus

	Fall Enrollment					Degrees Conferred				
	Fall 2005	Fall 2006	Fall 2007	Fall 2008	Fall 2009	2004-05	2005-06	2006-07	2007-08	2008-09
Undergraduate										
Agricultural & Resource Economics: Resource Economics Major, Environmental Economics & Policy Concentration, Environmental Economics & Policy Minor[1]	72	88	60	67	98	20	33	42	47	29
Natural Resources & the Environment: Natural Resources Major, Air & Water Resources Concentration, Environmental Conservation Concentration, Fisheries & Wildlife Conservation Concentration, Forest Resources Concentration, Geometrics Concentration, Wildlife Conservation Minor	77	89	84	77	82	16	20	30	33	23
Plant Science & Landscape Architecture: Horticulture Major, Landscape Architecture Major, Turfgrass & Soil Science Major, Ornamental Horticulture Minor, Landscape Design Minor, Turfgrass Management Minor	139	124	128	120	100	43	54	34	38	50
Environmental Science Major[2]	34	30	25	36	63	7	6	5	7	9
Pathobiology Major	61	70	65	74	81	19	9	20	12	17
Master's										
Agricultural & Resource Economics	12	13	15	7	11	1	9	8	12	7
Natural Resources: Land, Water, & Air	16	23	23	23	18	7	3	10	2	6
Plant Science	7	12	12	11	6	3	4	1	2	4
Pathobiology	11	6	3	4	6	5	2	4	3	3
Doctoral										
Agricultural & Resource Economics	20	21	20	24	19	1	5	4	3	2
Natural Resources: Land, Water, & Air	13	14	16	13	19	2	0	2	3	0
Plant Science	15	15	15	14	16	2	1	4	5	4
Pathobiology	14	10	11	12	11	2	3	2	1	0
Total Master's and Doctoral										
Agricultural & Resource Economics	32	34	35	31	30	2	14	12	15	9
Natural Resources: Land, Water, & Air	29	37	39	36	37	9	3	12	5	6
Plant Science	22	27	27	25	22	5	5	5	7	8
Pathobiology	25	16	14	16	17	7	5	6	4	3

Note: Undergraduate minors may be a double-count of a student also listed with their major.

[1] The Environmental Economics and Policy minors are also shown on the College of Liberal Arts and Sciences table since the minor is offered by both Colleges.

[2] Environmental Science majors that are in the College of Agriculture and Natural Resources are reported above. There are additional Environmental Science students that are in the College of Liberal Arts and Sciences reported on the Liberal Arts table.

OIR/October 26, 2009

SCHOOL OF ENGINEERING

The UConn School of Engineering contributes significantly to the creation of jobs, technological ingenuity, business startups and economic advancement in the state of Connecticut and, indeed, the region. In recent years, as the nation has grown increasingly sensitized to the complex interrelationships linking the environment, natural resources, energy, health and climate, UConn Engineering has focused its expertise more acutely on helping to address these challenges and advance a culture of informed stewardship and sustainable technologies.

This focus on sustainability has gained momentum with the advent of the federal economic stimulus package. The School of Engineering is keenly committed to developing the forward-thinking, agile workforce that will propel the green revolution. Below are a few of the initiatives currently underway in the School of Engineering that contribute toward this culture of sustainability and green engineering.

Undergraduate Training in Green Engineering
(Chemical Engineering, Civil Engineering, Environmental Engineering, Mechanical Engineering, Computer Science & Engineering, Electrical Engineering, Materials Science & Engineering)

The strong academic and research emphases in Green Engineering enable students to pursue studies in seven disciplines that are listed below:

- Civil Engineering: sustainable buildings, resilient infrastructures; health monitoring, energy efficiency
- Chemical Engineering: biofuels, fuel cells, electrochemical engineering, biochemical engineering, reaction engineering.
- Computer Science & Engineering: modeling and simulation of energy systems, efficiency devices and usage.
- Electrical Engineering: wind and solar energy, power systems, high voltage engineering and microwave technologies.
- Environmental Engineering: biogeochemical processes, air pollution and atmospheric processes, hydro-geosciences, waste treatment, land reclamation, climate analysis.
- Materials Science & Engineering: energy applications, thermodynamics of materials, phase equilibria, and microstructural characterization.
- Mechanical Engineering: thermodynamics, combustion, fuel cells, heat transfer, carbon sequestration, and biofuels.

Students enrolled in these programs can specialize in areas related to Green Engineering through coursework including Air Pollution; Environmental Rate Processes; Introduction to Nuclear Engineering; Bioremediation; Water Quality Engineering; Environmental Geology; Water Pollution; Pollution from Combustion; Biochemical Engineering.

Other extracurricular activities include:

- Participation in co-operative education and internships at firms engaged in clean energy conversion (UTC Power, Fuel Cell Energy, Connecticut Light and Power, Dominion Nuclear, etc) and environmental remediation (Fuss & O'Neill, URS, Kiewit & Sons, etc).
- Undergraduate research in faculty laboratories is an important component to the training of students in Green Engineering opportunities. Students are provided with either course credit or stipend to participate in the many aspects of research including experiment design, measurements, and analysis.

Joule Fellows

- The School initiated a new National Science Foundation, $500K program that brings middle and high school teachers to campus for five weeks of intensive immersion in energy-related research.

- This Research Experiences for Teachers program is an innovative approach to acquainting students with engineering and energy engineering concepts and careers. Because engineering is not included in the curricula of most schools, students are not exposed to engineering principles at a time when they are formulating career ideas.
- By engaging their teachers in cutting-edge energy and engineering research, this program aims to enrich middle and high school classrooms with hands-on experiments that expose the students to energy engineering principles and outcomes.

Graduate Fellowships in Sustainable Energy Technologies
(Chemical Engineering, Civil Engineering, Environmental Engineering, Mechanical Engineering, Computer Science & Engineering, Electrical Engineering, Materials Science & Engineering)

- The recently awarded $700K U.S. Dept of Energy Graduate Assistantships in Areas of National Need (GAANN) will be used to train and educate doctoral students in the critically important field of clean energy.
- The motivation for this program is to train GAANN Fellows to play a central role in new discoveries that will enable the advancement of energy technologies including fuel cells, wind and solar power, waste-to-energy conversion, carbon sequestration and distributed power distribution.

Microbial Fuel Cells and Wastewater Filtration
(Civil Engineering, Environmental Engineering, Environmental Engineering)

- Several faculty members have partnered with environmental companies to develop advanced fuel cells and water treatment protocols using microbial activity. Professor Baikun Li and her partners at Fuss & O'Neill seek to harness the energy-production capabilities of microscopic bacteria to produce power and clean wastewater on a large commercial scale.
- The aim is to develop efficient microbial fuel cells that rely on carbohydrate-rich wastewater at water treatment plants as a feedstock for large-scale fuel cells. Related research between Drs. Li and Jeffrey McCutcheon focuses on improving the wastewater filtration system that is less energy intensive and more cost effective than the current options.
- The projects have an immediate impact on the education of graduate students and employees of the partnering company, and in the longer term these research programs will help to build a green energy industry that blends wastewater cleanup with carbon-neutral energy production.

Eminent Faculty Initiative in Sustainable Energy
(Chemical Engineering, Civil Engineering, Environmental Engineering, Mechanical Engineering, Computer Science & Engineering, Electrical Engineering, Materials Science & Engineering)

- The School launched a new program in late 2007 –rooted in the 2006 enactment of Connecticut's 21st Century Jobs bill and with support from the State of Connecticut and industrial partners FuelCell Energy, the Northeast Utilities Foundation and UTC – to conduct advanced research, education and training in renewable, low CO_2 impact energy including fuel cells, biofuels and other sustainable technologies.
- The core initiative has attracted 12 world-class faculty members whose advanced energy research will, in turn, attract top graduate students and lead to a novel green energy curriculum across the engineering disciplines.
- Involving undergraduate and graduate students in novel energy research, this Initiative will nurture enormous interest in, and excitement for, energy careers.

Biofuel Consortium
(Chemical Engineering, Department of Chemistry, College of Agriculture & Natural Resources)

- The multidisciplinary consortium of faculty and students from various departments across the university aims to stimulate a biofuels industry within Connecticut, thus reducing the state's reliance on fossil fuels and associated environmental and health impacts. Dr. Richard Parnas heads the consortium, whose efforts include the collection and conversion of waste oils collected only from on-campus dining halls into transportation biofuel. Both state and federal dollars have funded the efforts of the consortium.
- An important aspect of the biofuel initiative involves the educational component: the 50 gallon/week biodiesel facility serves as an educational laboratory for chemical engineering students at UConn as well as a demonstration project for visiting school groups.
- Furthemore, the consortium partners with the Center for Continuing Education at UConn to develop a new Certificate Program in Biofuels for business executives, town managers and other decision makers.

Industry Partnerships
(Chemical Engineering, Civil Engineering, Environmental Engineering, Mechanical Engineering, Computer Science & Engineering, Electrical Engineering, Materials Science & Engineering)

- The Center for Clean Energy Engineering (C2E2, formerly the Connecticut Global Fuel Cell Center) maintains close alliances with regional energy companies. FuelCell Energy, Inc. of Danbury, CT has worked with the CGFCC to develop an advanced electrochemical hydrogen separator (EHS), a device that will be used with the company's Direct FuelCell® power plants.
- This program was sponsored by the Connecticut Clean Energy Fund and targets the demonstration of a novel technology that separates hydrogen from other gases.
- The C2E2 has also partnered with UTC Power for a Yankee Ingenuity grant that served as the first application of a reliability assurance methodology to fuel cell systems.
- This program will contribute substantially to the deployment and commercialization of a 5 kW fuel cell-based backup power system designed for the telecommunications industry. These activities contribute new, advanced products/processes and also enrich the energy workforce.

University of Connecticut

School of Engineering

Programs with Environmental Focus

	Fall Enrollment					Degrees Conferred				
	Fall 2005	Fall 2006	Fall 2007	Fall 2008	Fall 2009	2004-05	2005-06	2006-07	2007-08	2008-09
Undergraduate Majors with a Primary Focus on the Environment										
Chemical Engineering, Environmental Engineering, Civil Engineering	346	387	396	455	500	55	58	71	86	102
Undergraduate Majors with Enabling Skill Development										
Electrical Engineering, Materials Science & Engineering, Computer Science & Engineering, Mechanical Engineering, Engineering Physics	846	863	853	931	949	177	161	180	188	202
Master's Programs with a Primary Focus on the Environment										
Chemical Engineering, Environmental Engineering, Civil Engineering	50	37	46	56	68	41	31	21	21	29
Doctoral Programs with a Primary Focus on the Environment										
Chemical Engineering, Environmental Engineering, Civil Engineering	64	55	52	49	60	20	13	17	13	6
Total Master's and Doctoral Programs with a Primary Focus on the Environment										
Chemical Engineering, Environmental Engineering, Civil Engineering	114	92	98	105	128	61	44	38	34	35
Master's Programs with Enabling Skill Development										
Electrical Engineering, Materials Science & Engineering, Computer Science & Engineering, Mechanical Engineering	96	93	115	100	100	51	50	34	34	29
Doctoral Programs with Enabling Skill Development										
Electrical Engineering, Materials Science & Engineering, Computer Science & Engineering, Mechanical Engineering	182	182	204	199	220	15	27	27	31	13
Total Master's and Doctoral Programs with Enabling Skill Development										
Electrical Engineering, Materials Science & Engineering, Computer Science & Engineering, Mechanical Engineering	278	275	319	299	320	66	77	61	65	42

OIR/October 26, 2009

COLLEGE OF LIBERAL ARTS AND SCIENCES

The College of Liberal Arts and Sciences is an intellectually diverse collection of 23 academic departments and a variety of interdisciplinary programs and centers. Thematic areas of study such as the environment occur in many different corners of the college. In this document we have collected several of our strongest areas as representative of our focus on this topic. We first discuss our signature undergraduate program in "Environmental Science" with a growing number of enrolled students. Scholarly research as well as teaching occurs in all of our academic departments and centers and we have selected programs in the Departments of Chemistry, Marine Sciences, Ecology and Evolutionary Biology, and Geography to highlight in this report. An emerging program in "Human Behavior and the Environment" is an important part of our planning for future teaching and scholarship in this important area of environmental studies. The college is proud of its efforts in outreach and public engagement and we discuss the Bioblitz program as an example of our efforts in this area.

Environmental Science

An interdisciplinary major for undergraduates with a strong science component, offered jointly with the College of Agriculture and Natural Resources

- The undergraduate Environmental Science major is based in the physical and biological sciences and incorporates relevant components from nine departments across two colleges at UConn. As a result, it is one of the University's primary interdisciplinary undergraduate programs.
- The major leads to a Bachelor of Science degree in either the College of Agriculture and Natural Resources or the College of Liberal Arts and Sciences, depending on the students' interests and background. The cross-disciplinary curriculum offers a comprehensive approach to the study of environmental problems built on a traditionally rigorous scientific background.
- The core requirements for the major include a year each of Biology, Mathematics, Chemistry, Physics, and Geology as well as introductory courses in the Hydrosphere, Ecology, Meteorology and Resource Economics. Upper level students then focus in a particular area of the environmental sciences where they often complete a detailed senior thesis and/or analyze social and economic implications of specific environmental issues.
- Since the ENVS curriculum was reorganized in 2004, the number of applications to the major has nearly tripled from about 65 to nearly 180 per year in 2008. During the same time period the number of enrolled majors nearly doubled to over 110.
- Many of the Environmental Science graduates continue their research interests in the environmental sciences through graduate programs around the country or accept employment at local environmental consulting companies or State or Federal agencies such as the Connecticut Department of Environmental Protection or the U.S. Environmental Protection Agency.

Chemistry

Federally funded research and graduate training programs in basic science leading to applications in clean energy, environmental remediation, and renewable resources. Core contributions to the education of all scientists and engineers.

- The Chemistry Department has several funded programs in the area of environmental and green chemistry.
- The National Science Foundation (NSF) is supporting a research project to develop methods to use microwaves to transform biological materials and waste products into useful and combustible products. The microwave radiation causes molecular heating and can accelerate chemical reactions, leading to a significant time saving and improving product yields. The reactions are either solvent-free or else use water as the solvent. This makes them environmentally clean as well as efficient and is an important example of the concept of "green chemistry."

- Another NSF supported research project is a joint UConn-industrial investigation of the synthesis of so-called green catalysts for enhancing (or suppressing) bacterial growth in petroleum products. The ability of these catalytic materials to modify the rate at which these microbes use petroleum to satisfy their nutritional requirements for carbon has a number of environmentally beneficial applications.
- The US Department of Energy (DOE) supports research projects to study fuel cell components in order to remove detrimental impurities and enhance their efficiency.
- Another DOE project supports a study of selective oxidation catalysts for environmental remediation and seawater desalination.
- A synthesis of novel battery materials for use in extreme environments in collaboration with Yardney Technical Products of Pawcatuck, CT is funded by the Global Intelligence.
- The Chemistry Department is also a participant in a new cross-college Bio-Energy Consortium that recently was awarded $1.5 million in federal funding to analyze the benefits and develop methods of shifting to bio-energy.
- These examples of funded research projects in green and environmental chemistry brings a total of $3.2 million in federal, state and industrial support to the department and support the research activity of 10 doctoral students.
- The department has also recently added an environmental chemistry concentration to its undergraduate curriculum which has attracted significant student interest.

Marine Sciences

Interdisciplinary research and teaching in Marine Science, especially Long Island Sound, including the study of heavy metals in the environment, invasive species, fisheries, the sea-air boundary and climate change. Recipient of substantial funding from Federal and other sources.

- The Department of Marine Sciences is located at UConn's coastal campus at Avery Point and has a number of signature programs focusing on the marine and coastal environment.
- The Long Island Sound Integrated Coastal Observing System (LISICOS), is a unique project for Marine Sciences that provides real-time and continuous records of the biological, chemical and physical properties of the water for researchers, coastal managers, fishermen, boaters, and weather forecasters. Despite natural resources and commercial and recreational opportunities valued at more than $5.5 billion annually, LIS remains an understudied coastal sea that suffers from eutrophication, hypoxia, toxic or nuisance algal blooms, and depleted fish and shellfish stocks.
- A new $500 thousand award from NOAA's Oceans and Human Health Initiative (OHHI) has lead to a partnership with CT Sea Grant, Mystic Aquarium, and NOAA NMFS Milford Laboratory, to train doctoral students and post-doctoral researchers in critical issues for the coastal zone, including marine pollution, diseases and pathogens.
- A four-year, $1 million research project investigating the genetic makeup of organisms that cause coastal red tides is the subject of a new public exhibit at Mystic Aquarium.
- Marine Sciences is in the forefront of global studies of mercury cycling in marine environments the and impact on human health via bio-accumulation in freshwater and marine fish.
- The Mercury Laboratory, in operation for more than 30 years, is nationally and internationally recognized for pioneering research on Arctic lakes, coastal waters, and the global ocean.
- The department is also studying the marine bioinvasions in Long Island Sound where faculty and students are documenting the distribution, ecology, and potential impacts of the invasive species on the Long Island Sound ecosystem. Students learn the fundamentals of marine benthic community ecology, participate in advanced technology development (e.g., underwater video surveys), and assist with public outreach and education through CT Sea Grant.
- Another important research area is marine meteorology where interactions between the atmosphere and the ocean's surface that drive storms, waves, and currents are being investigated. This research is critical to improving predictions of climate change based on direct measurements of carbon dioxide exchange between the ocean and atmosphere.

- A unique project in marine ecology uses satellite-based remote sensing imagery to measure phytoplankton and organic matter in coastal waters. Shallow waters are optically complex, and present significant challenges for ocean optics, a specialized field involving measurement of optical and physical properties of the water column.
- The Department had funded research expenditures of over $5 million in FY 2008 with 12 masters and 33 doctoral students working on projects of coastal and marine science.

Ecology and Evolutionary Biology

Worldwide research basic research into ecology and the genetic basis of the interaction between organisms and their environment having applications in conservation biology both locally and abroad, biodiversity and sustainability, and the control of invasive species. Fundamental training for life scientists at the undergraduate and graduate levels. Extensive Federal and other funding.

- The Department of Ecology and Evolutionary Biology (EEB) has about 30 faculty members with research interests spanning a wide range of fields including population and community ecology; landscape ecology; conservation biology; biodiversity, systematics, and evolution; and animal behavior.
- Total grant awards average about $2.5 million per year, with most of the funding coming from the National Science Foundation (NSF), but significant funding also coming from other sources such as the U. S. Geological Survey, the Mellon Foundation, the Hudson River Foundation, and the Connecticut Department of Environmental Protection.
- Most faculty and about 50 graduate students work on basic research in ecology and evolutionary biology with implications for conservation biology and environmental protection.
- One of the EEB faculty recently received a $3 million NSF Planetary Biodiversity grant to lead a consortium of institutions in discovering and documenting the biodiversity of parasitic species.
- EEB researchers are heavily involved in studying the ecology and conservation of tropical forests in regions from Central America to Madagascar.
- Graduates of the doctoral program have taken academic positions with government or non-government agencies concerned with conservation and environmental issues.
- The B.S./M.S program in Biodiversity and Conservation Biology has successfully placed many students in environment-related internships, and many graduates of this program have gone on to jobs with environmental agencies.
- The Center for Conservation and Biodiversity, which is associated with the department, sponsors the Connecticut BioBlitz, a major public outreach effort, funds workshops related to environmental issues, and provides funding for graduate student research.
- The Invasive Plant Atlas of New England (IPANE) project is run by a consortium that includes UConn and several other universities and both state and federal agencies.
- EEB has 60 undergraduate majors, but our department also is responsible for advising and teaching many of the more than 900 Biological Science majors, as well as Environmental Science majors with a concentration in Environmental Biology.

Geography

An interdisciplinary approach to the interaction between human society and environmental factors; urban planning, transportation, resource management, and climate change. Applications of remote sensing and geographic information systems. Broad undergraduate and graduate programs.

- The Department of Geography has several active research programs related to environmental concerns as well as offering a wide range of courses that deal directly with issues of the environment. Each of the introductory core courses in geography has a section that deals with the environment in some fundamental way.
- Specific courses such as "GIS Modeling of Environmental Change," "Climate, Weather, & the Environment," "Environmental Evaluation & Assessment," "Climate and Weather," and "Human Modification of Natural Environments" focus entirely on current environmental issues.

- In addition the department offers a full complement of courses in the area of Geographical Information Systems (GIS), a technology that is in great demand by environmental firms.
- Over the past 3 years the department has graduated over 15 master students who have found careers with environmental firms located in Connecticut, Massachusetts, and New Jersey.
- Last year one of our undergraduate students was awarded a research assistantship in the Department of Environmental Sciences at the University of Virginia to continue his graduate education.
- Besides providing environmental education to students in the classroom, the faculty works with students on funded environmental projects.
- Grants to study environmentally related issues have come from national and international agencies including: the Connecticut Department of Public Health, the United States Agency for International Development, the Center for Transportation & Urban Planning at UConn, the New York City Department of Environmental Protection, and the National Oceanic and Atmospheric Administration.
- The grant funding for this environmental research, currently over $100 thousand, has tripled over the last several years.

Human Behavior and the Environment

A college wide initiative to strengthen expertise in understanding human contributions to environmental challenges and human approaches to managing those challenges, including technical, policy, and human rights implications of changes in the environment.

- In addition to the scientific focus of the programs discussed above, CLAS is actively expanding its presence in the area of "Human Behavior and the Environment."
- Ultimately, the quality of our environment depends on natural systems, human systems and the interactions between the two. Thus, advancing research and understanding regarding the environment will require a deeper consideration of the role of human behavior, at both the individual and institutional (policy) levels, and the factors that drive that behavior.
- The college has identified economics as an important component of a proposed thematic area in "Human Behavior and the Environment" and noted the need for additional expertise in this field.
- Economics plays an important role in understanding the behavioral factors affecting environmental quality and in designing and evaluating public policies to improve it. The number of environmental economists at UConn is small, but the faculty in this area has a record of collaborative work with faculty in the natural sciences and engineering.
- In addition, the Science Advisory Board of EPA has recently concluded that the EPA is in "dire" need of additional research in social and behavioral science. Thus, opportunities for additional collaboration are significant, and increasing faculty in this area should increase opportunities for competitive support.
- In addition, CLAS has a particular strength in the area of human rights. There are few human rights programs with a science and environmental policy focus. Investment in this area, with a focus on environmental justice and law, could provide the University with a first-mover advantage and leverage previous investments in human rights as well as existing expertise in environmental law in the UConn Law School.

Connecticut State BioBlitz

A renowned outreach program that unites scientists, college students, and school children to build an understanding of conservation and biodiversity. A model program adopted across the globe.

- The internationally recognized Connecticut State BioBlitz is now in its 10th year and is an important outreach and public engagement activity for CLAS. It brings together scientists, college students, and school children from a number of universities and scientific institutions in a race against time to see how many species they can find and identify in a 24-hour biological survey.
- The activity is funded through the College of Liberal Arts and Sciences, Center for Conservation & Biodiversity, Department of Ecology and Evolutionary Biology, the Connecticut State Museum of Natural History, in partnership with the Connecticut Department of Environmental Protection.

- During the 2009 event, scientists were able to identify 1,715 different plants and animals from Hartford's Keney Park, including adjacent reaches of the Connecticut River. Recorded species included numerous mammals, reptiles, amphibians, birds, fish, plants, mosses and lichens, algae, parasites, insects, spiders, and fungi.
- The participants included 26 middle school and high school students from across Connecticut that were selected as junior scientists to work alongside some of the region's top naturalists and environmental scientists. The students had guided mini-safaris, collected their own specimens, and offered presentations to the public.
- The Connecticut State BioBlitz has become a model for more than 500 similar events around the globe, whose singular charge is to reveal the wonderful diversity of life occurring just outside our backdoors. The event underscores the important role that urban environments can play in sustaining Connecticut's biological riches, and encourages curiosity and excitement about science in both children and adults.

University of Connecticut

All Campuses

College of Liberal Arts and Sciences

Programs with Environmental Focus

	Fall Enrollment					Degrees Conferred				
	Fall 2005	Fall 2006	Fall 2007	Fall 2008	Fall 2009	2004-05	2005-06	2006-07	2007-08	2008-09
Undergraduate Majors with a Primary Focus on the Environment										
Coastal Studies, Maritime Studies, Ecology and Evolutionary Biology, Environmental Science[1], Geography, Geology and Geophysics	209	239	244	249	264	46	61	40	60	73
Undergraduate Majors with Enabling Skill Development										
Biological Sciences, Chemistry, Economics, Mathematics, Applied Math Sciences, Math/Actuarial Science, Math/Statistics, Molecular and Cell Biology, Physics, Physiology and Neurobiology, Statistics, Structural Biology and Biophysics	2,037	2,246	2,465	2,746	2,943	383	495	527	592	622
Undergraduate Minors with a Primary Focus on the Environment										
Ecology and Evolutionary Biology, Environmental Economics and Policy[2], Environmental Studies, Geographic Information Systems, Geography, Geology and Geophysics, Marine Biology	1	5	8	13	15	18	21	23	37	43
Undergraduate Minors with Enabling Skill Development										
Biological Sciences, Chemistry, Economics, Mathematics, Molecular and Cell Biology, Physics, Physiology and Neurobiology, Statistics	26	63	92	95	101	110	124	162	208	215
Master's Degrees										
Graduate Programs in Areas of Environmental Education and Research										
I. Life Sciences										
Applied Genomics, Biochemistry, Biodiversity and Conservation Biology, Cell Biology, Ecology and Evolutionary Biology, Genetics, Microbial Systems Analysis, Microbiology, Physiology and Neurobiology, Structural Biology and Biophysics	50	51	63	77	95	31	28	38	25	40

II. Mathematics and Physical Sciences										
Chemistry, Geological Sciences, Mathematics, Applied Financial Mathematics, Oceanography, Physics, Polymer Science, Statistics	89	109	99	101	123	76	54	83	68	82
III. Social Sciences										
Economics, Geography, Public and Non-Profit Management Certificate[3], Public Administration M.P.A., Public Financial Management Certificate[3]	70	82	101	122	110	40	37	32	55	77
Doctoral Degrees										
Graduate Programs in Areas of Environmental Education and Research										
I. Life Sciences										
Biochemistry, Cell Biology, Ecology and Evolutionary Biology, Genetics, Microbiology, Physiology and Neurobiology, Structural Biology and Biophysics	154	159	150	148	154	23	21	16	20	16
II. Mathematics and Physical Sciences										
Chemistry, Geological Sciences, Mathematics, Oceanography, Physics, Polymer Science, Statistics	348	352	370	377	356	27	40	49	39	42
III. Social Sciences										
Economics, Geography	63	65	62	52	61	10	3	9	6	9
Total Master's and Doctoral Degrees										
Graduate Programs in Areas of Environmental Education and Research										
I. Life Sciences										
Applied Genomics M.S., Biochemistry, Biodiversity and Conservation Biology, Cell Biology, Ecology and Evolutionary Biology, Genetics, Microbial Systems Analysis M.S., Microbiology, Physiology and Neurobiology, Structural Biology and Biophysics	204	210	213	225	249	54	49	54	45	56
II. Mathematics and Physical Sciences										
Chemistry, Geological Sciences, Mathematics, Applied Financial Mathematics M.S., Oceanography, Physics, Polymer Science, Statistics	437	461	469	478	479	103	94	132	107	124
III. Social Sciences										
Economics, Geography, Public and Non-Profit Management Certificate[3], Public Administration M.P.A., Public Financial Management Certificate[3]	133	147	163	174	171	50	40	41	61	86

Note: Minors are not reported on the required annual Connecticut Department of Higher Education and Federal IPEDS Degrees Conferred Survey. Students enrolled with a minor reported in the fields above are as of tenth-day of the fall term. A student may add a minor after the tenth day of classes, or during the spring term, which will not be reflected in the enrollment counts of minors above.

[1] Environmental Science majors that are in the College of Liberal Arts and Sciences are reported above. There are additional Environmental Science students that are in the College of Agriculture and Natural Resources reported on the Agriculture table. (This is not a duplicate count.)

[2] The Environmental Economics and Policy minors are also shown on the College of Liberal Arts and Sciences table since the minor is offered by both Colleges. (This is a duplicate count.)

[3] The Public and Non-Profit Management Certificate and the Public Financial Management Certificate are not reported on the Connecticut Department of Higher Education and Federal IPEDS Degrees Conferred Survey.

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